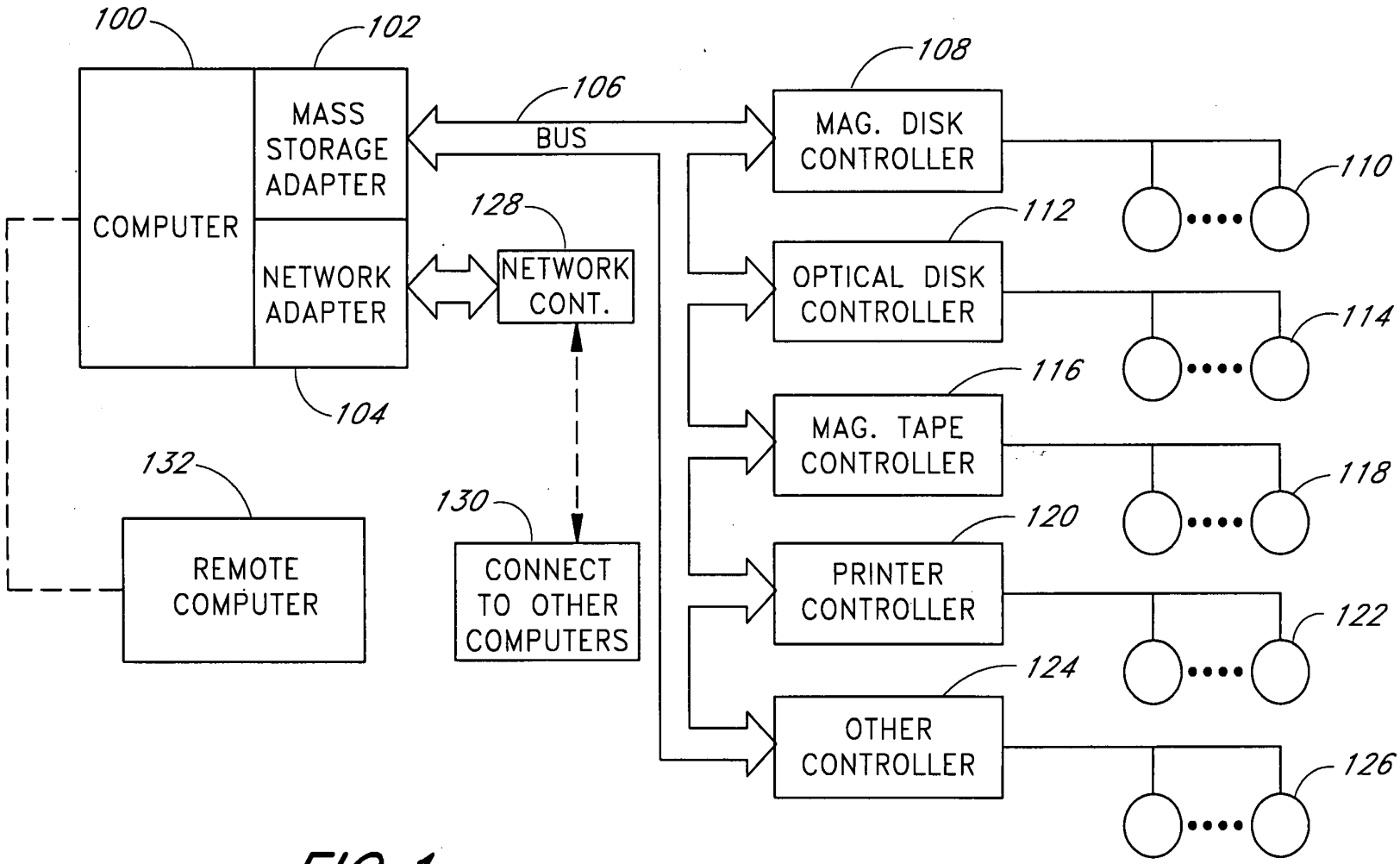
100
102
MASS STORAGE ADAPTER
COMPUTER
NETWORK ADAPTER
104
106
BUS
128
NETWORK CONT.
132
REMOTE COMPUTER
130
CONNECT TO OTHER COMPUTERS
108
MAG. DISK CONTROLLER
110
112
OPTICAL DISK CONTROLLER
114
116
MAG. TAPE CONTROLLER
118
120
PRINTER CONTROLLER
122
124
OTHER CONTROLLER
126

FIG. 1

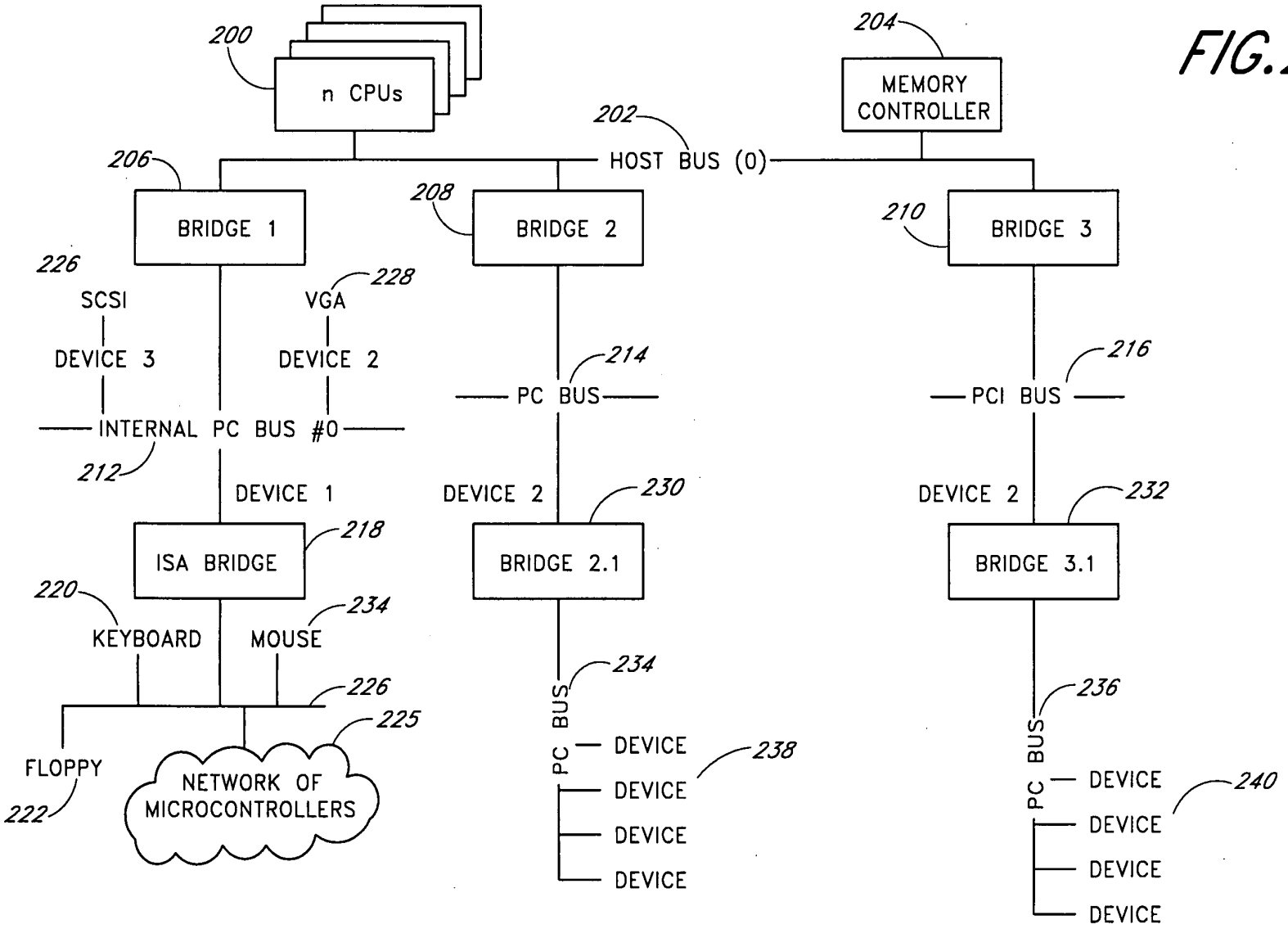
200
n CPUs
204
MEMORY CONTROLLER
202
HOST BUS (0)
206
BRIDGE 1
208
BRIDGE 2
210
BRIDGE 3
226
SCSI
DEVICE 3
228
VGA
DEVICE 2
214
PC BUS
216
PCI BUS
INTERNAL PC BUS #0
212
DEVICE 1
DEVICE 2
230
DEVICE 2
232
ISA BRIDGE
218
BRIDGE 2.1
BRIDGE 3.1
220
KEYBOARD
234
MOUSE
234
226
225
PC BUS
DEVICE
DEVICE
DEVICE
DEVICE
238
236
PC BUS
DEVICE
DEVICE
DEVICE
DEVICE
240
FLOPPY
222
NETWORK OF MICROCONTROLLERS

FIG.2

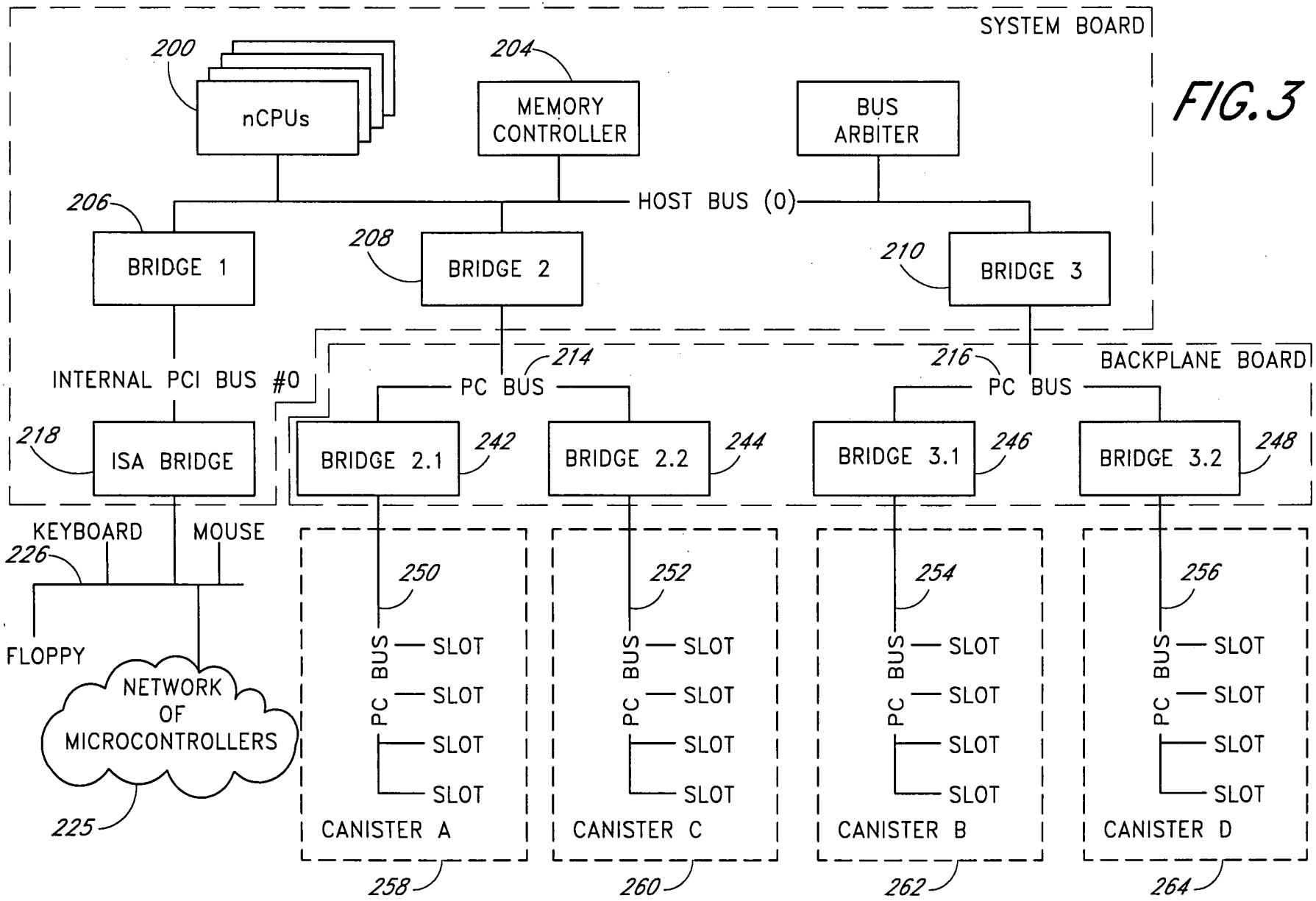
SYSTEM BOARD
200
nCPUs
204
MEMORY CONTROLLER
BUS ARBITER
HOST BUS (0)
206
BRIDGE 1
208
BRIDGE 2
210
BRIDGE 3
BACKPLANE BOARD
INTERNAL PCI BUS #0
214
PC BUS
216
PC BUS
218
ISA BRIDGE
BRIDGE 2.1
242
BRIDGE 2.2
244
BRIDGE 3.1
246
BRIDGE 3.2
248
KEYBOARD
MOUSE
226
FLOPPY
NETWORK OF MICROCONTROLLERS
225
250
PC BUS
SLOT
SLOT
SLOT
SLOT
CANISTER A
258
252
PC BUS
SLOT
SLOT
SLOT
SLOT
CANISTER C
260
254
PC BUS
SLOT
SLOT
SLOT
SLOT
CANISTER B
262
256
PC BUS
SLOT
SLOT
SLOT
SLOT
CANISTER D
264

FIG. 3

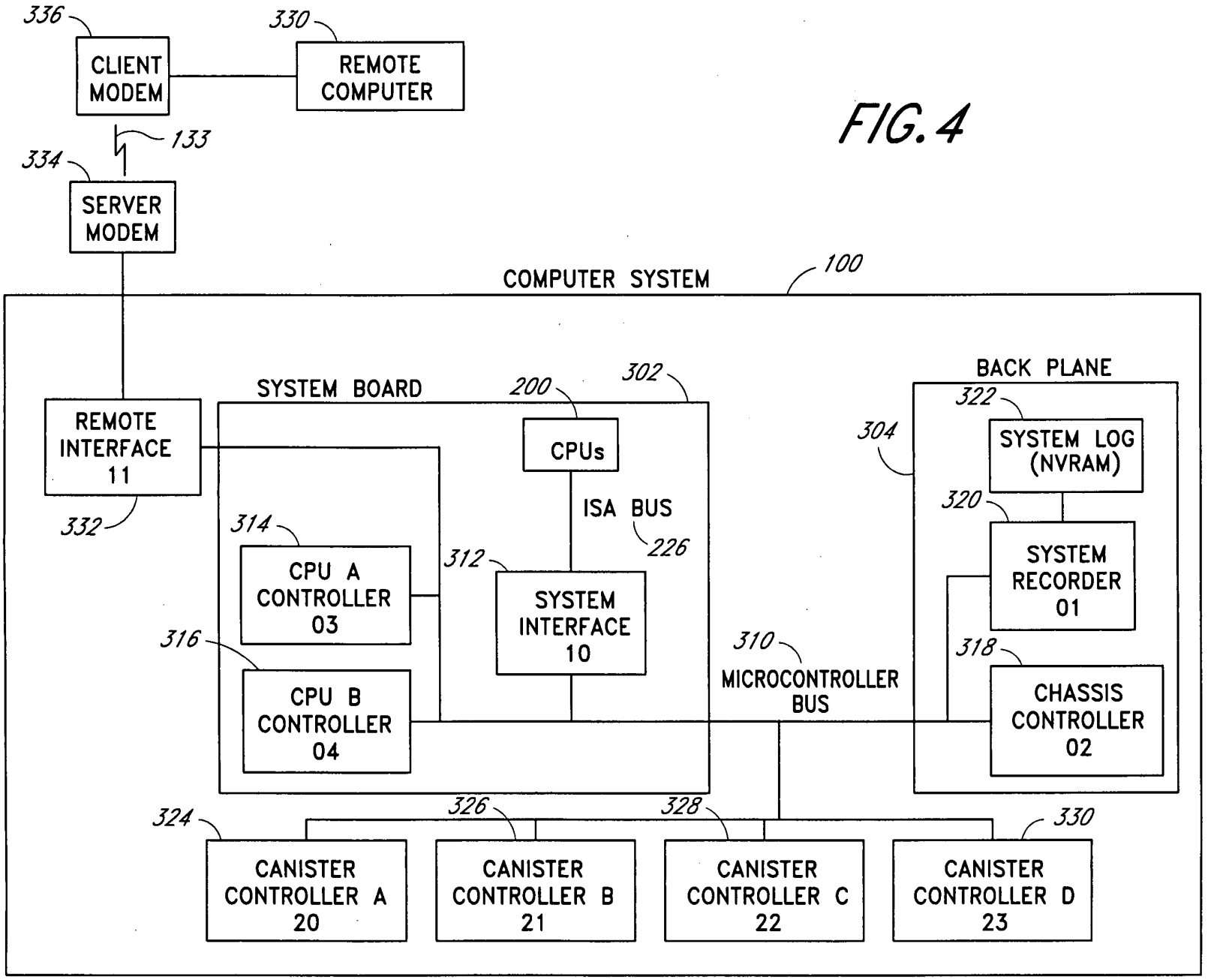
336
CLIENT MODEM
330
REMOTE COMPUTER
133
334
SERVER MODEM
COMPUTER SYSTEM
100
REMOTE INTERFACE 11
332
SYSTEM BOARD
200
302
CPUs
ISA BUS
226
314
CPU A CONTROLLER 03
312
SYSTEM INTERFACE 10
316
CPU B CONTROLLER 04
310
MICROCONTROLLER BUS
BACK PLANE
322
304
SYSTEM LOG (NVRAM)
320
SYSTEM RECORDER 01
318
CHASSIS CONTROLLER 02
324
326
328
330
CANISTER CONTROLLER A 20
CANISTER CONTROLLER B 21
CANISTER CONTROLLER C 22
CANISTER CONTROLLER D 23

FIG. 4

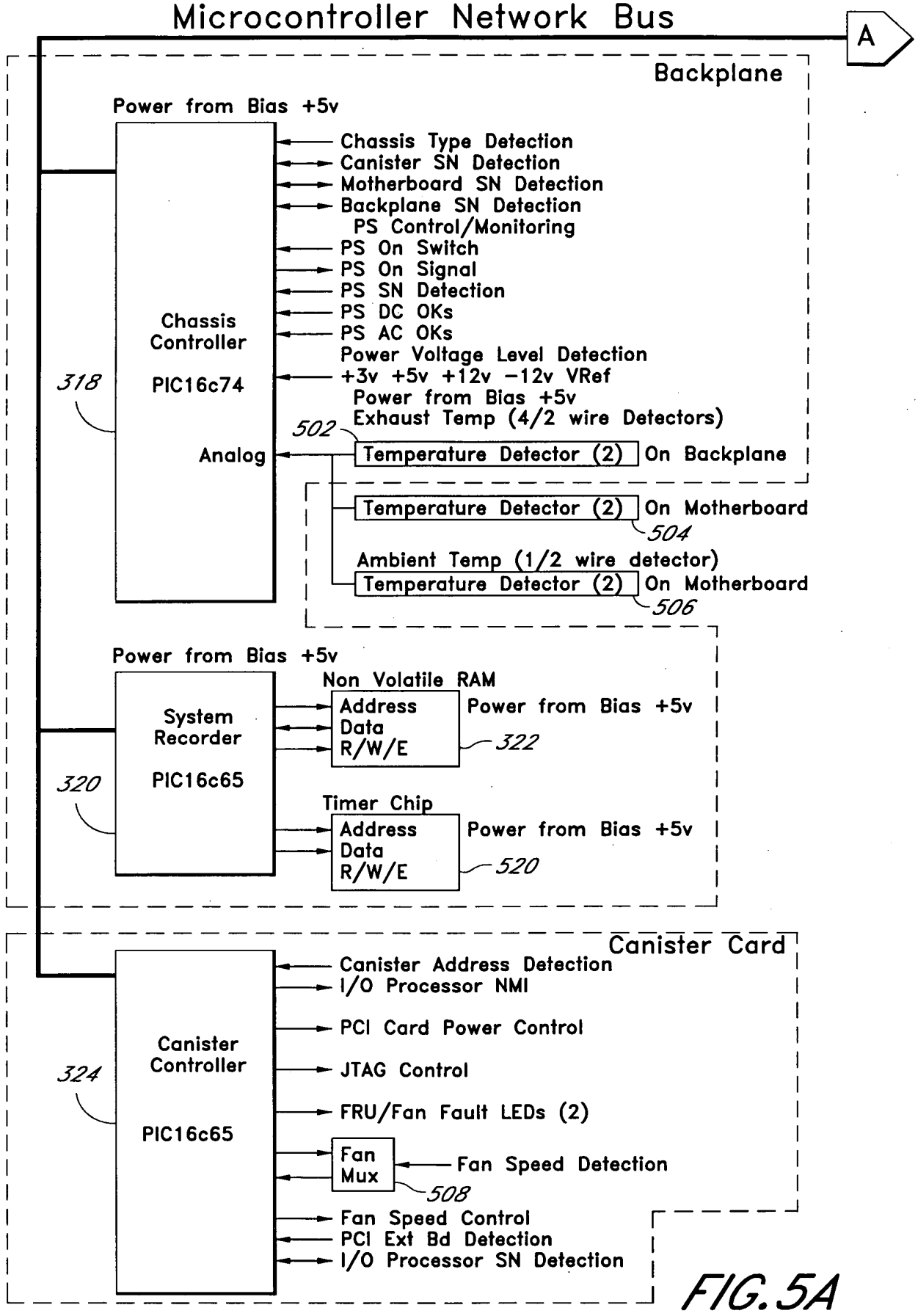
Microcontroller Network Bus
A
Backplane
Power from Bias +5v
Chassis Type Detection
Canister SN Detection
Motherboard SN Detection
Backplane SN Detection
PS Control/Monitoring
PS On Switch
PS On Signal
PS SN Detection
PS DC OKs
PS AC OKs
Power Voltage Level Detection
+3v +5v +12v −12v VRef
Power from Bias +5v
Exhaust Temp (4/2 wire Detectors)
Chassis Controller
PIC16c74
318
Analog
502
Temperature Detector (2)
On Backplane
Temperature Detector (2)
On Motherboard
504
Ambient Temp (1/2 wire detector)
Temperature Detector (2)
On Motherboard
506
Power from Bias +5v
Non Volatile RAM
Address
Data
R/W/E
Power from Bias +5v
322
System Recorder
PIC16c65
320
Timer Chip
Address
Data
R/W/E
Power from Bias +5v
520
Canister Card
Canister Address Detection
I/O Processor NMI
PCI Card Power Control
JTAG Control
FRU/Fan Fault LEDs (2)
Canister Controller
PIC16c65
324
Fan Mux
Fan Speed Detection
508
Fan Speed Control
PCI Ext Bd Detection
I/O Processor SN Detection

FIG. 5A

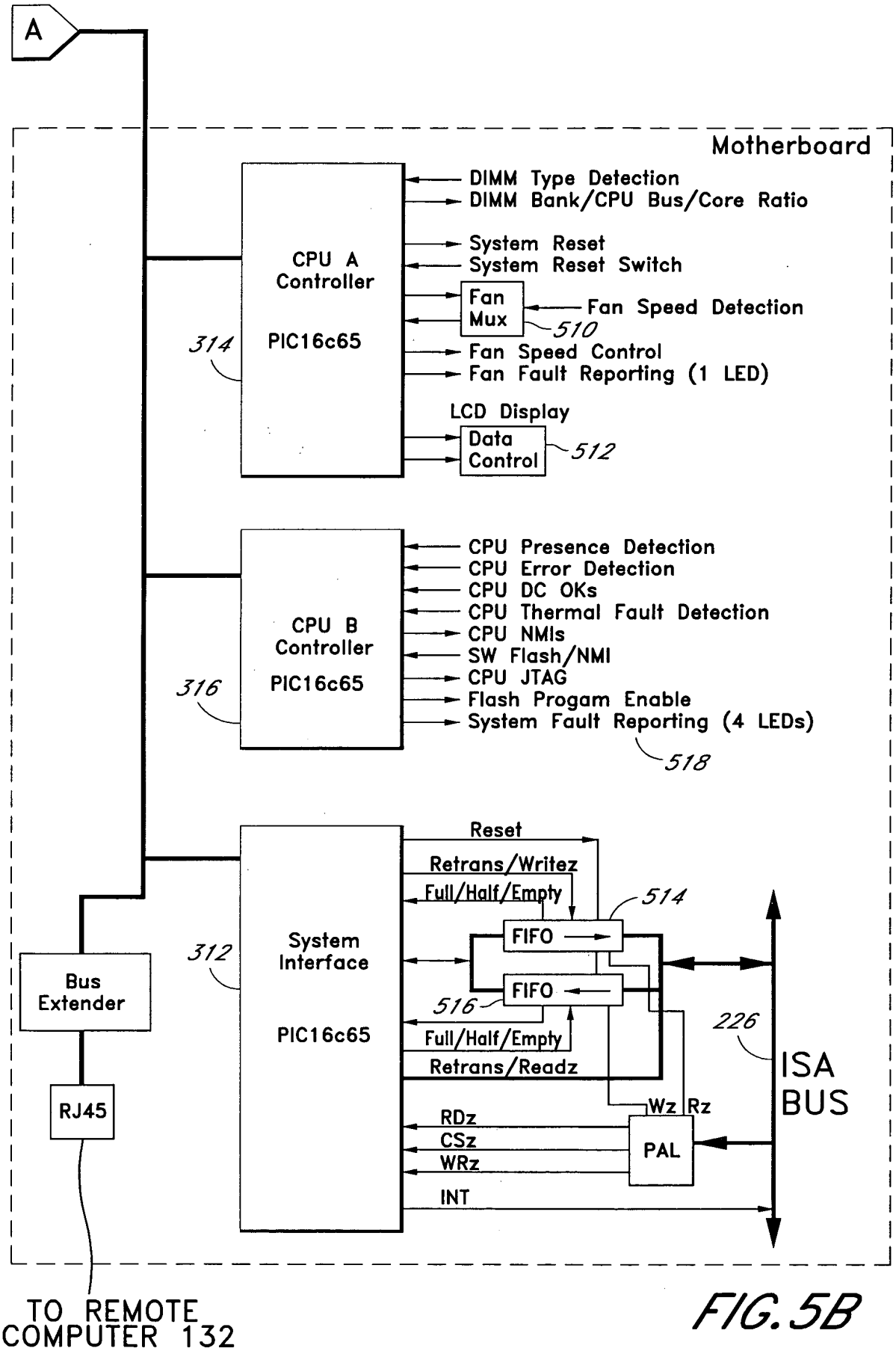
A
Motherboard
CPU A Controller
PIC16c65
314
DIMM Type Detection
DIMM Bank/CPU Bus/Core Ratio
System Reset
System Reset Switch
Fan Mux
510
Fan Speed Detection
Fan Speed Control
Fan Fault Reporting (1 LED)
LCD Display
Data Control
512
CPU B Controller
PIC16c65
316
CPU Presence Detection
CPU Error Detection
CPU DC OKs
CPU Thermal Fault Detection
CPU NMIs
SW Flash/NMI
CPU JTAG
Flash Progam Enable
System Fault Reporting (4 LEDs)
518
System Interface
PIC16c65
312
Reset
Retrans/Writez
Full/Half/Empty
514
FIFO
FIFO
516
Full/Half/Empty
Retrans/Readz
Wz
Rz
RDz
CSz
WRz
PAL
INT
226
ISA BUS
Bus Extender
RJ45
TO REMOTE COMPUTER 132

FIG. 5B

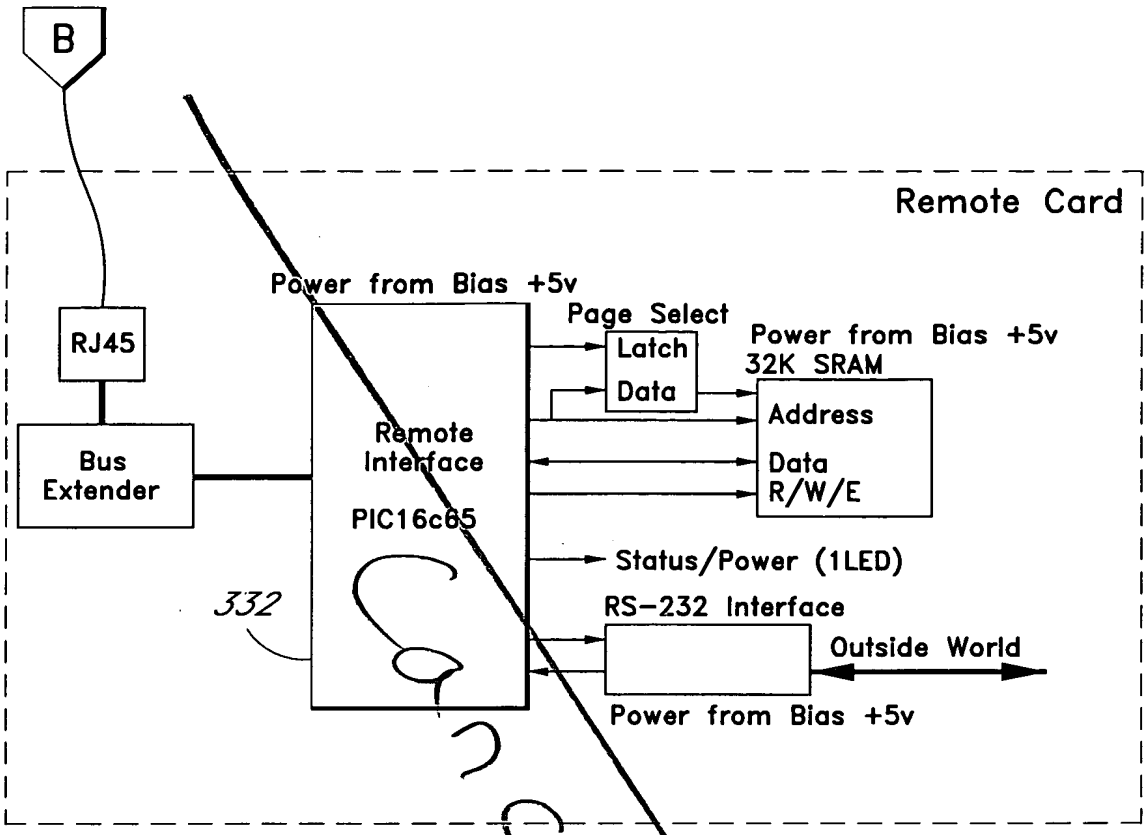
B
Remote Card
RJ45
Bus Extender
Power from Bias +5v
Remote Interface
PIC16c65
332
Page Select
Latch
Data
Power from Bias +5v
32K SRAM
Address
Data
R/W/E
Status/Power (1LED)
RS-232 Interface
Outside World
Power from Bias +5v

FIG. 5C

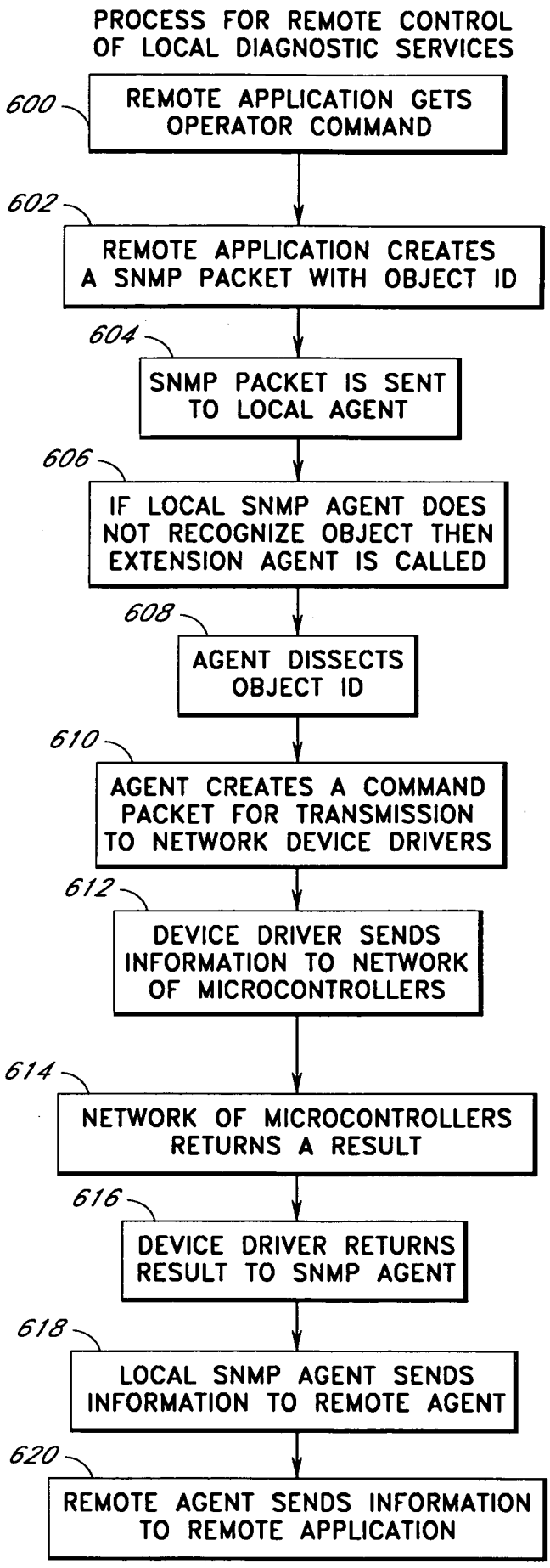
PROCESS FOR REMOTE CONTROL OF LOCAL DIAGNOSTIC SERVICES
600
REMOTE APPLICATION GETS OPERATOR COMMAND
602
REMOTE APPLICATION CREATES A SNMP PACKET WITH OBJECT ID
604
SNMP PACKET IS SENT TO LOCAL AGENT
606
IF LOCAL SNMP AGENT DOES NOT RECOGNIZE OBJECT THEN EXTENSION AGENT IS CALLED
608
AGENT DISSECTS OBJECT ID
610
AGENT CREATES A COMMAND PACKET FOR TRANSMISSION TO NETWORK DEVICE DRIVERS
612
DEVICE DRIVER SENDS INFORMATION TO NETWORK OF MICROCONTROLLERS
614
NETWORK OF MICROCONTROLLERS RETURNS A RESULT
616
DEVICE DRIVER RETURNS RESULT TO SNMP AGENT
618
LOCAL SNMP AGENT SENDS INFORMATION TO REMOTE AGENT
620
REMOTE AGENT SENDS INFORMATION TO REMOTE APPLICATION

FIG. 6

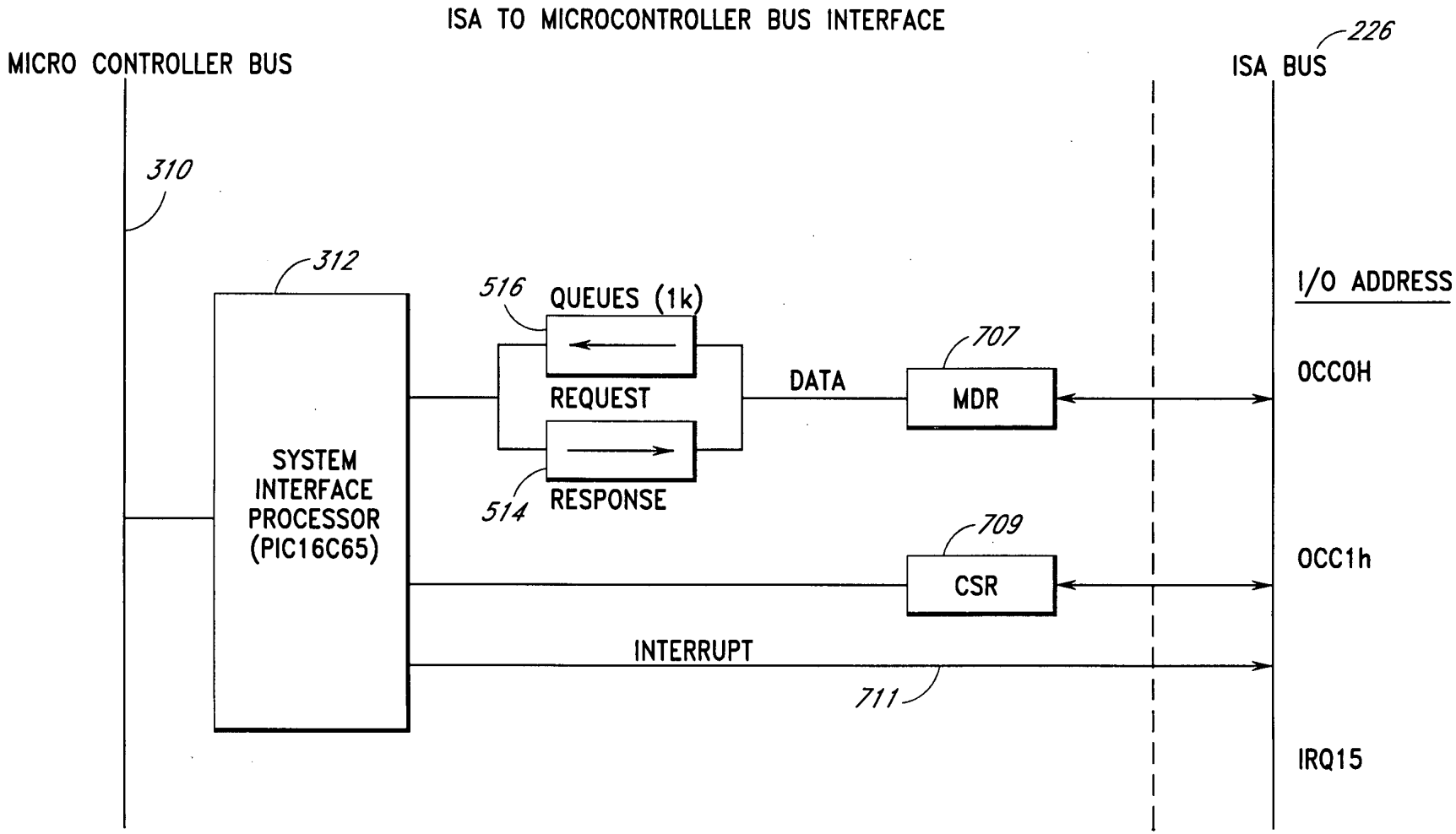
ISA TO MICROCONTROLLER BUS INTERFACE
MICRO CONTROLLER BUS
ISA BUS
226
310
312
516
QUEUES (1k)
REQUEST
RESPONSE
514
DATA
707
MDR
I/O ADDRESS
OCC0H
SYSTEM
INTERFACE
PROCESSOR
(PIC16C65)
709
CSR
OCC1h
INTERRUPT
711
IRQ15

FIG. 7

MASTER TO SLAVE COMMUNICATION

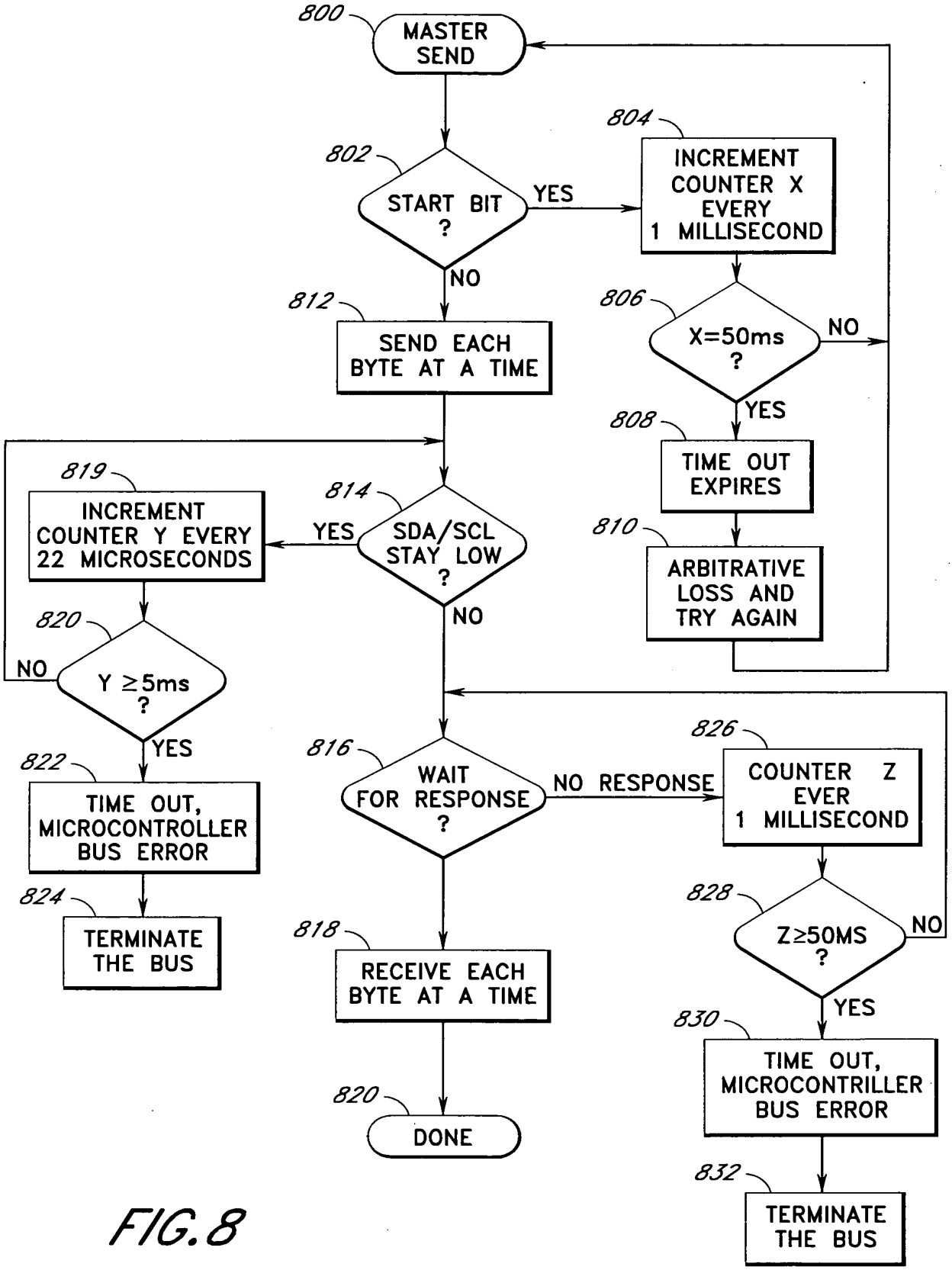

FIG. 8

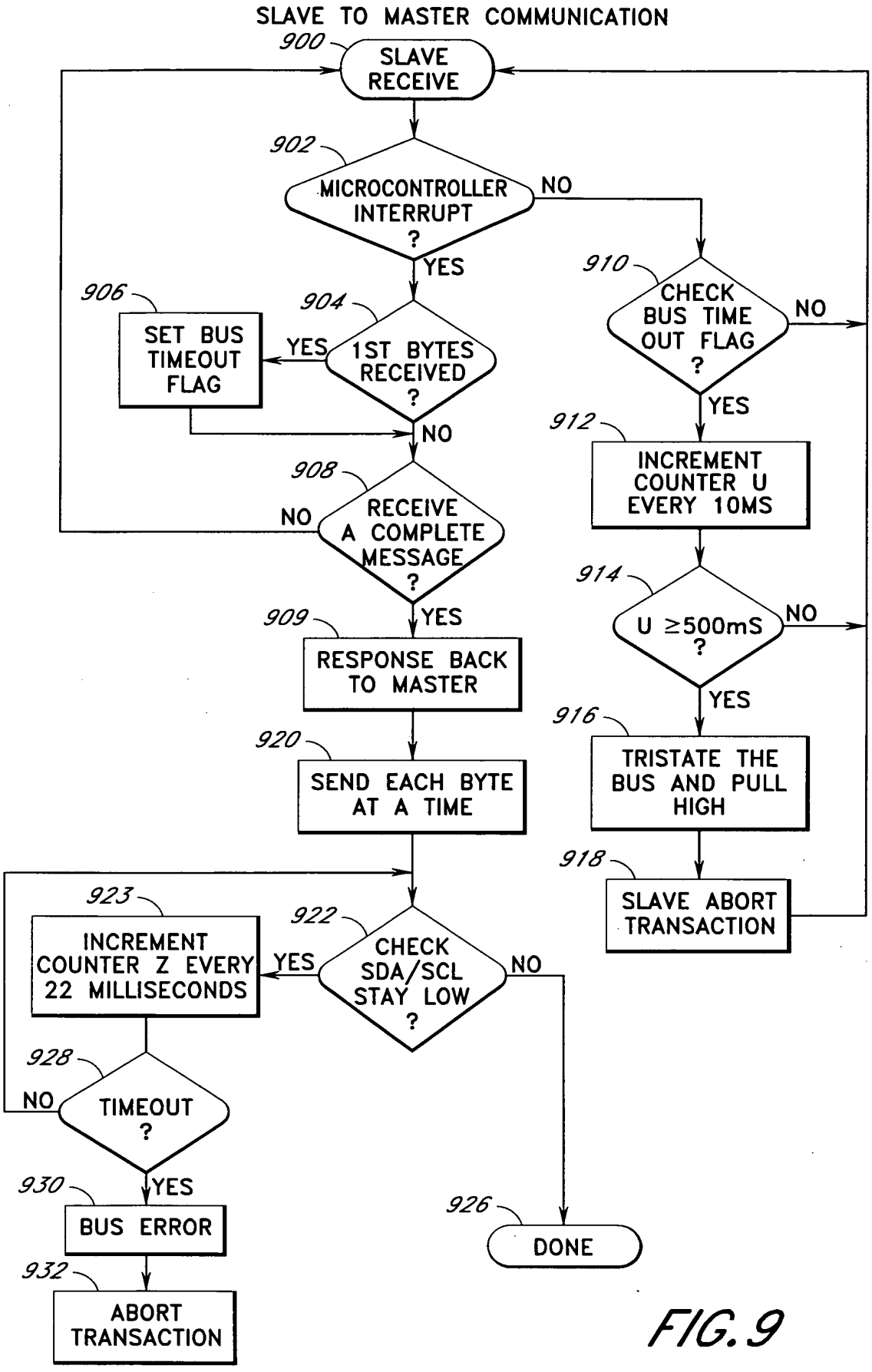
SLAVE TO MASTER COMMUNICATION
900
SLAVE RECEIVE
902
MICROCONTROLLER INTERRUPT ?
NO
YES
910
CHECK BUS TIME OUT FLAG ?
NO
YES
906
SET BUS TIMEOUT FLAG
904
1ST BYTES RECEIVED ?
YES
NO
912
INCREMENT COUNTER U EVERY 10MS
908
RECEIVE A COMPLETE MESSAGE ?
NO
YES
914
U ≥500mS ?
NO
YES
909
RESPONSE BACK TO MASTER
916
TRISTATE THE BUS AND PULL HIGH
920
SEND EACH BYTE AT A TIME
918
SLAVE ABORT TRANSACTION
923
INCREMENT COUNTER Z EVERY 22 MILLISECONDS
922
CHECK SDA/SCL STAY LOW ?
YES
NO
928
TIMEOUT ?
NO
YES
930
BUS ERROR
926
DONE
932
ABORT TRANSACTION

FIG. 9

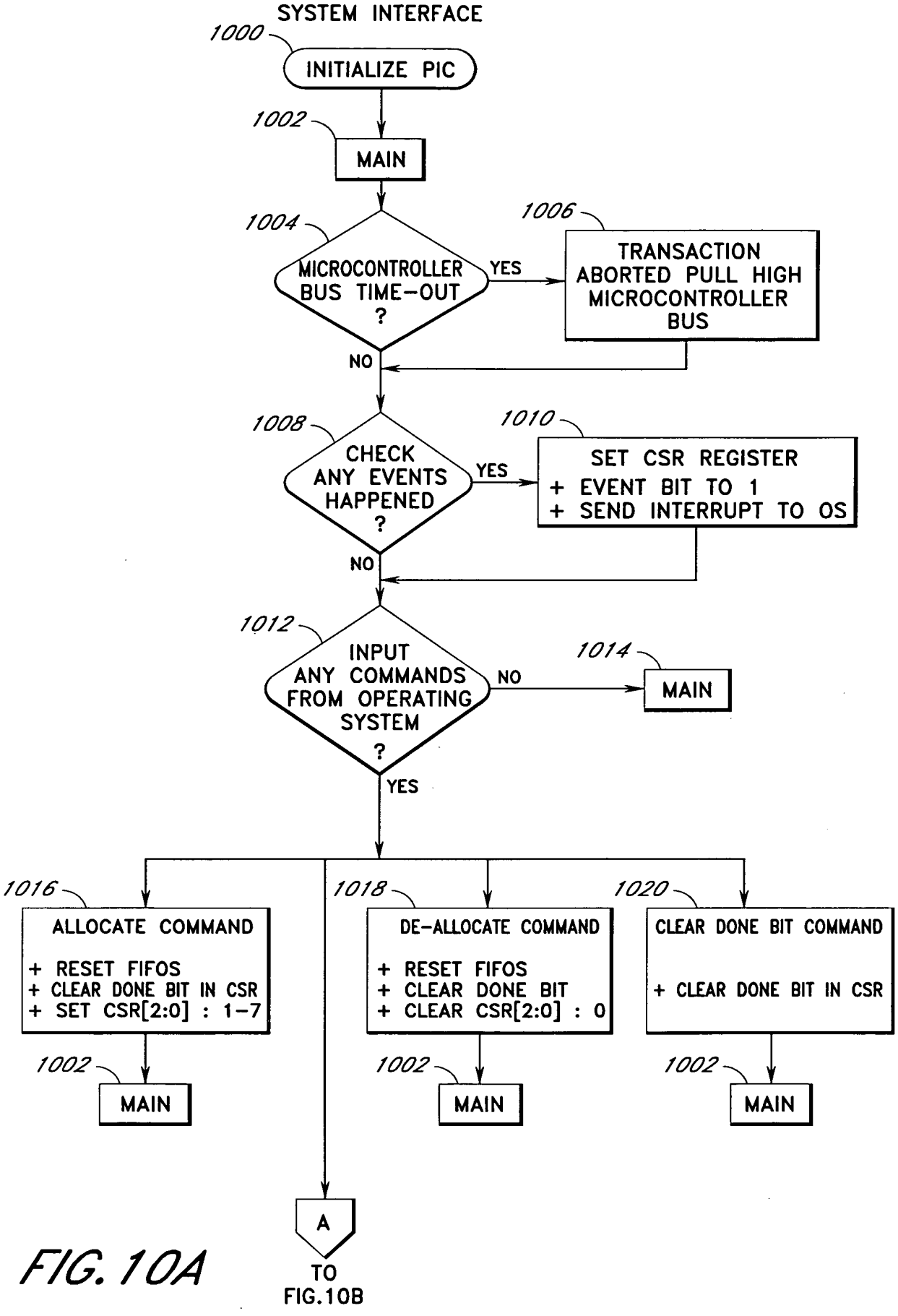
SYSTEM INTERFACE
1000
INITIALIZE PIC
1002
MAIN
1004
MICROCONTROLLER BUS TIME-OUT ?
YES
1006
TRANSACTION ABORTED PULL HIGH MICROCONTROLLER BUS
NO
1008
CHECK ANY EVENTS HAPPENED ?
YES
1010
SET CSR REGISTER
+ EVENT BIT TO 1
+ SEND INTERRUPT TO OS
NO
1012
INPUT ANY COMMANDS FROM OPERATING SYSTEM ?
NO
1014
MAIN
YES
1016
ALLOCATE COMMAND
+ RESET FIFOS
+ CLEAR DONE BIT IN CSR
+ SET CSR[2:0] : 1-7
1002
MAIN
1018
DE-ALLOCATE COMMAND
+ RESET FIFOS
+ CLEAR DONE BIT
+ CLEAR CSR[2:0] : 0
1002
MAIN
1020
CLEAR DONE BIT COMMAND
+ CLEAR DONE BIT IN CSR
1002
MAIN
A
TO FIG.10B

FIG. 10A

SYSTEM INTERFACE (CONTINUED)

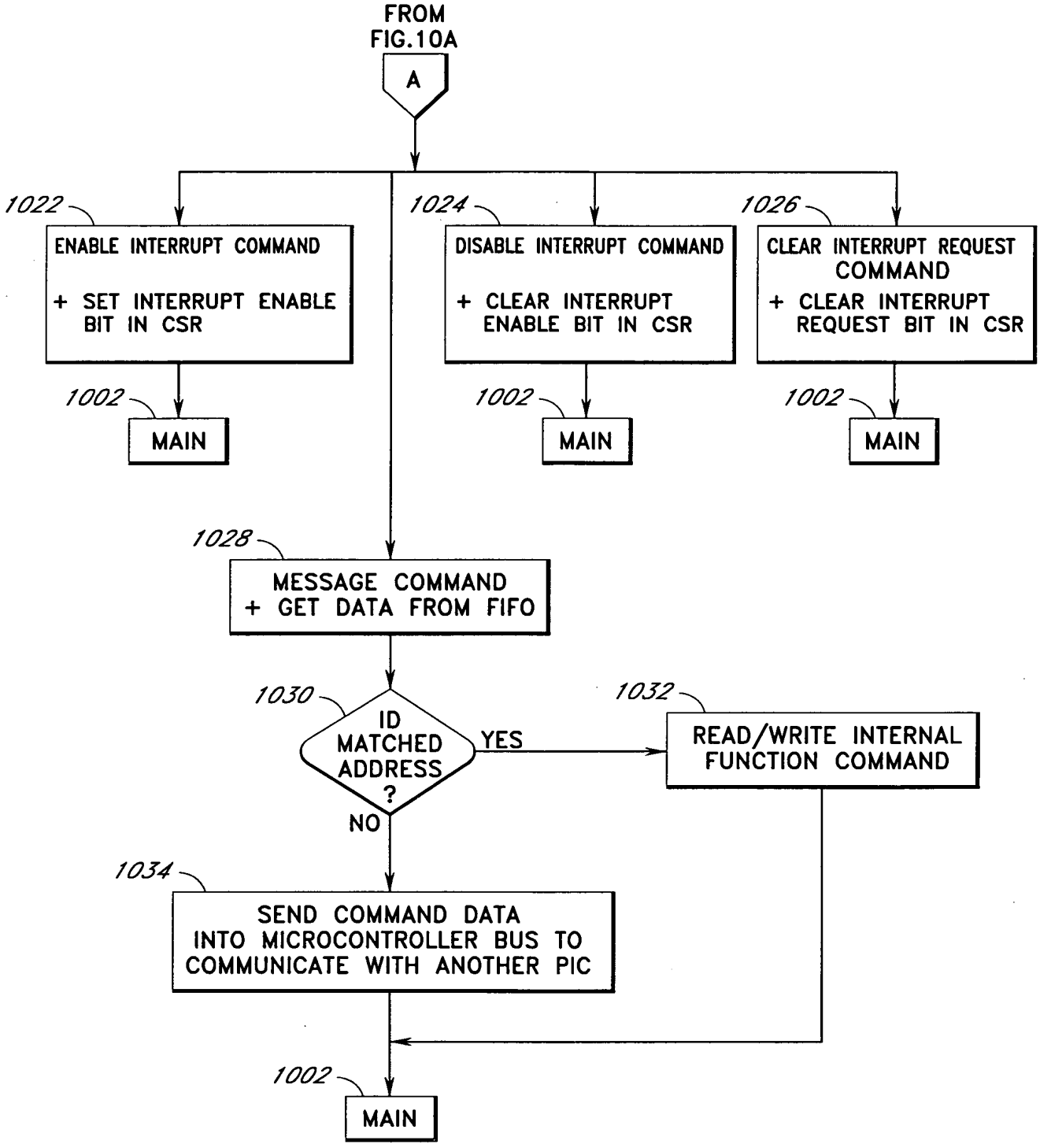

FIG. 10B

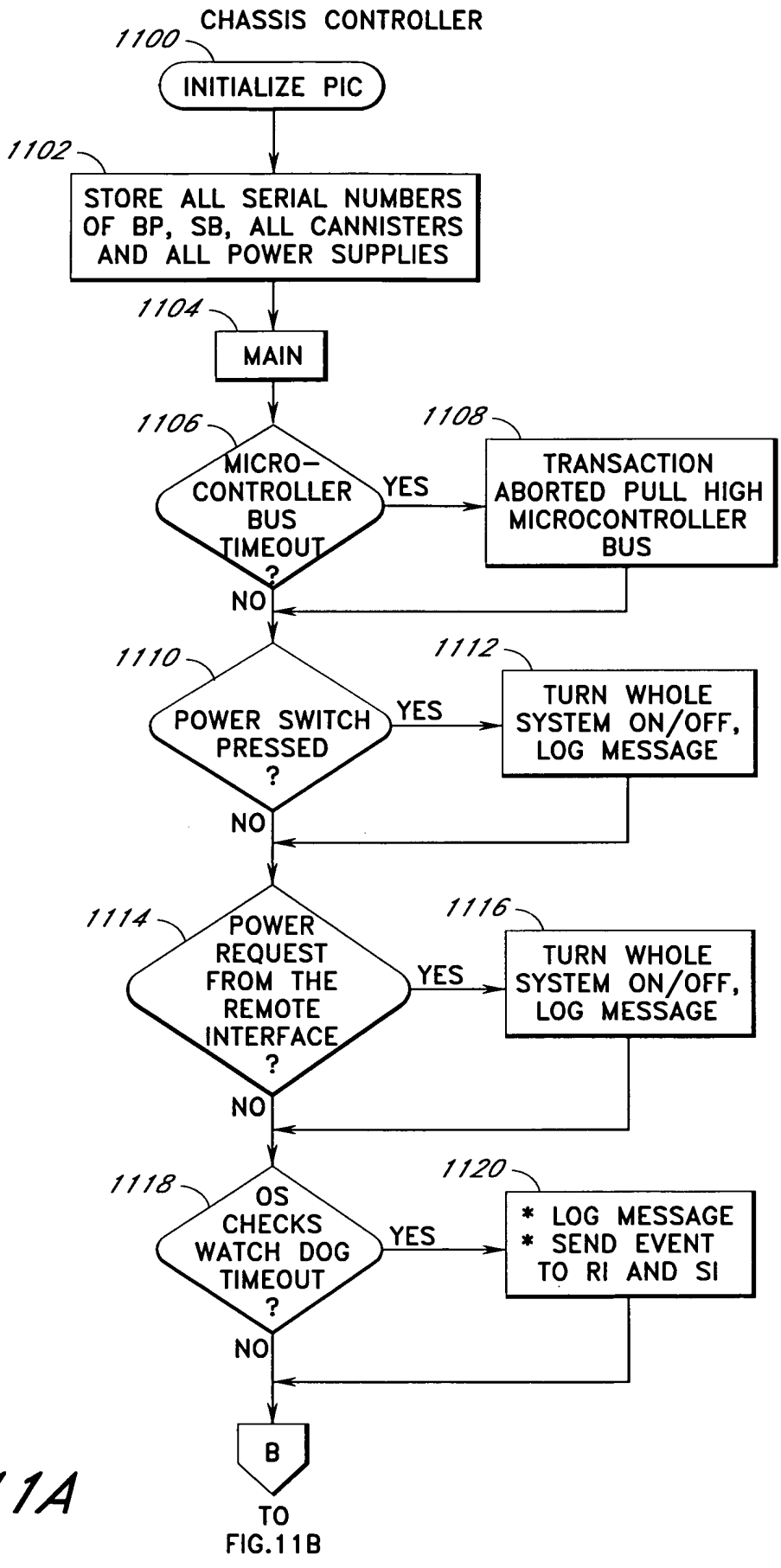
CHASSIS CONTROLLER
1100
INITIALIZE PIC
1102
STORE ALL SERIAL NUMBERS OF BP, SB, ALL CANNISTERS AND ALL POWER SUPPLIES
1104
MAIN
1106
MICRO-CONTROLLER BUS TIMEOUT ?
YES
1108
TRANSACTION ABORTED PULL HIGH MICROCONTROLLER BUS
NO
1110
POWER SWITCH PRESSED ?
YES
1112
TURN WHOLE SYSTEM ON/OFF, LOG MESSAGE
NO
1114
POWER REQUEST FROM THE REMOTE INTERFACE ?
YES
1116
TURN WHOLE SYSTEM ON/OFF, LOG MESSAGE
NO
1118
OS CHECKS WATCH DOG TIMEOUT ?
YES
1120
* LOG MESSAGE
* SEND EVENT TO RI AND SI
NO
B
TO FIG.11B

FIG. 11A

CHASSIS CONTROLLER (CONTINUED)

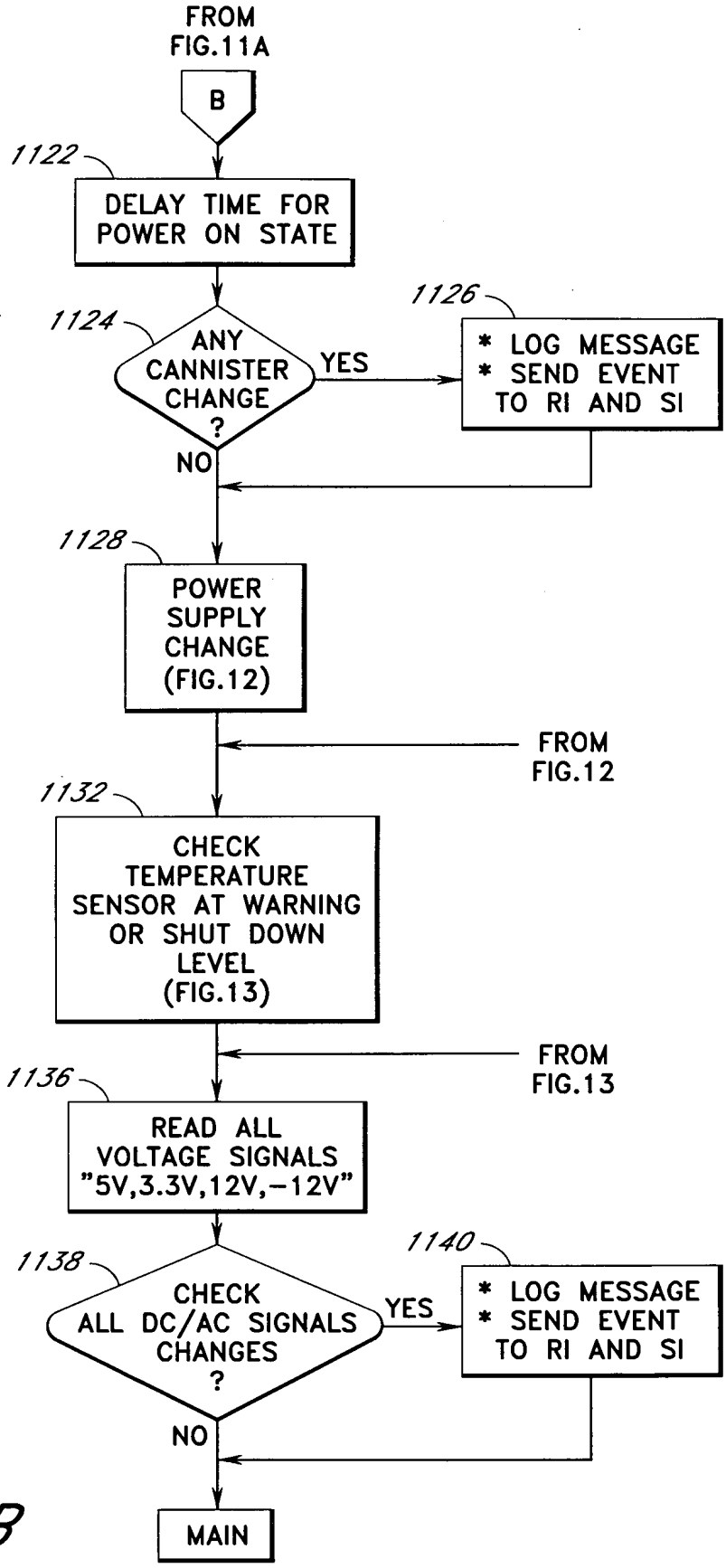

FIG. 11B

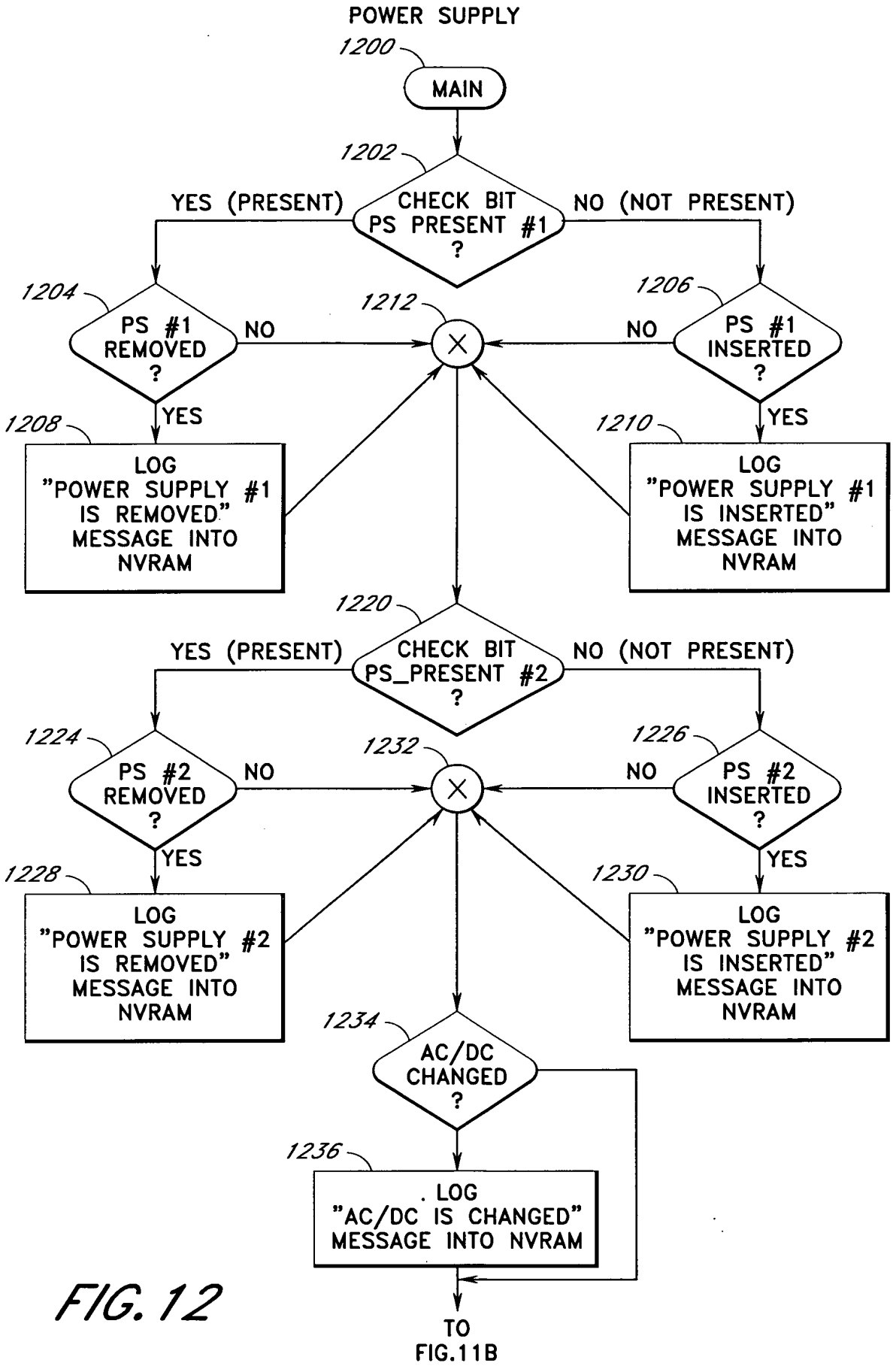
POWER SUPPLY
1200
MAIN
1202
CHECK BIT PS PRESENT #1 ?
YES (PRESENT)
NO (NOT PRESENT)
1204
PS #1 REMOVED ?
NO
1212
NO
1206
PS #1 INSERTED ?
YES
YES
1208
LOG "POWER SUPPLY #1 IS REMOVED" MESSAGE INTO NVRAM
1210
LOG "POWER SUPPLY #1 IS INSERTED" MESSAGE INTO NVRAM
1220
CHECK BIT PS_PRESENT #2 ?
YES (PRESENT)
NO (NOT PRESENT)
1224
PS #2 REMOVED ?
NO
1232
NO
1226
PS #2 INSERTED ?
YES
YES
1228
LOG "POWER SUPPLY #2 IS REMOVED" MESSAGE INTO NVRAM
1230
LOG "POWER SUPPLY #2 IS INSERTED" MESSAGE INTO NVRAM
1234
AC/DC CHANGED ?
1236
LOG "AC/DC IS CHANGED" MESSAGE INTO NVRAM
TO FIG.11B

FIG. 12

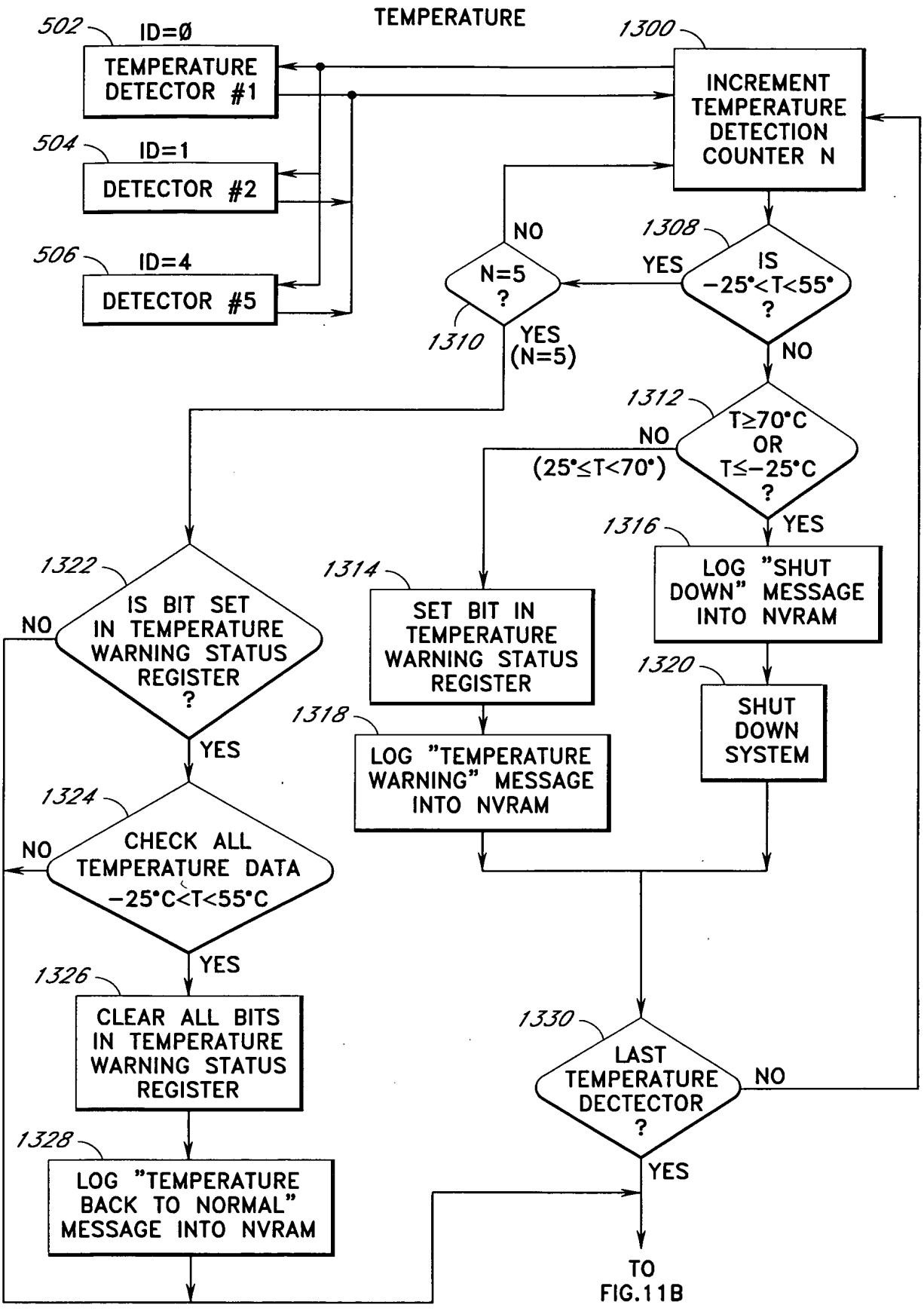
TEMPERATURE
502
ID=Ø
TEMPERATURE DETECTOR #1
504
ID=1
DETECTOR #2
506
ID=4
DETECTOR #5
1300
INCREMENT TEMPERATURE DETECTION COUNTER N
1308
IS −25°<T<55° ?
YES
NO
N=5 ?
NO
1310
YES (N=5)
1312
T≥70°C OR T≤−25°C ?
NO (25°≤T<70°)
YES
1316
LOG "SHUT DOWN" MESSAGE INTO NVRAM
1320
SHUT DOWN SYSTEM
1314
SET BIT IN TEMPERATURE WARNING STATUS REGISTER
1318
LOG "TEMPERATURE WARNING" MESSAGE INTO NVRAM
1322
IS BIT SET IN TEMPERATURE WARNING STATUS REGISTER ?
NO
YES
1324
CHECK ALL TEMPERATURE DATA −25°C<T<55°C
NO
YES
1326
CLEAR ALL BITS IN TEMPERATURE WARNING STATUS REGISTER
1328
LOG "TEMPERATURE BACK TO NORMAL" MESSAGE INTO NVRAM
1330
LAST TEMPERATURE DECTECTOR ?
NO
YES
TO FIG.11B

FIG. 13

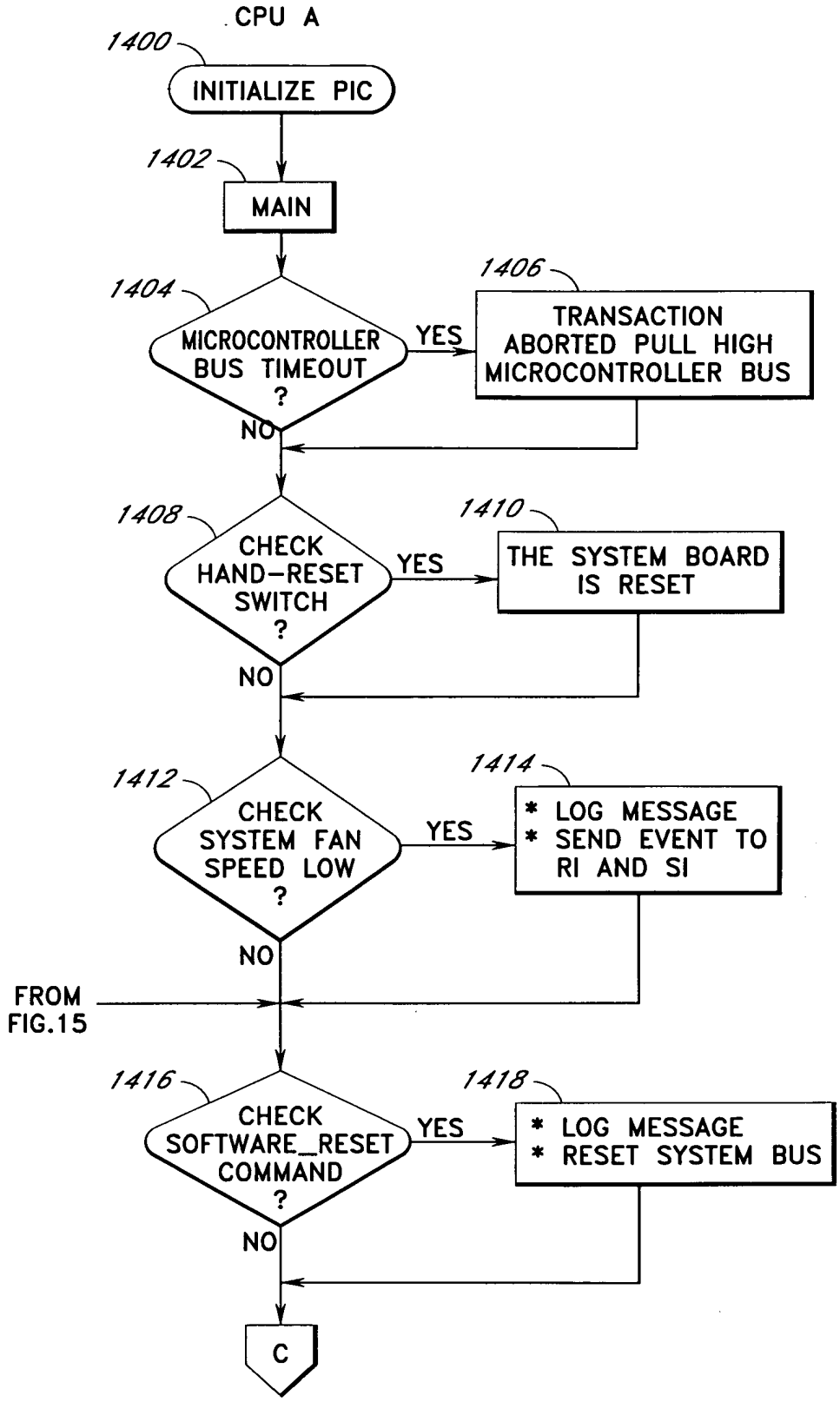
CPU A
1400
INITIALIZE PIC
1402
MAIN
1404
MICROCONTROLLER BUS TIMEOUT ?
YES
1406
TRANSACTION ABORTED PULL HIGH MICROCONTROLLER BUS
NO
1408
CHECK HAND-RESET SWITCH ?
YES
1410
THE SYSTEM BOARD IS RESET
NO
1412
CHECK SYSTEM FAN SPEED LOW ?
YES
1414
* LOG MESSAGE
* SEND EVENT TO RI AND SI
NO
FROM FIG.15
1416
CHECK SOFTWARE_RESET COMMAND ?
YES
1418
* LOG MESSAGE
* RESET SYSTEM BUS
NO
C
TO FIG.14B

FIG. 14A

CPU A (CONTINUED)

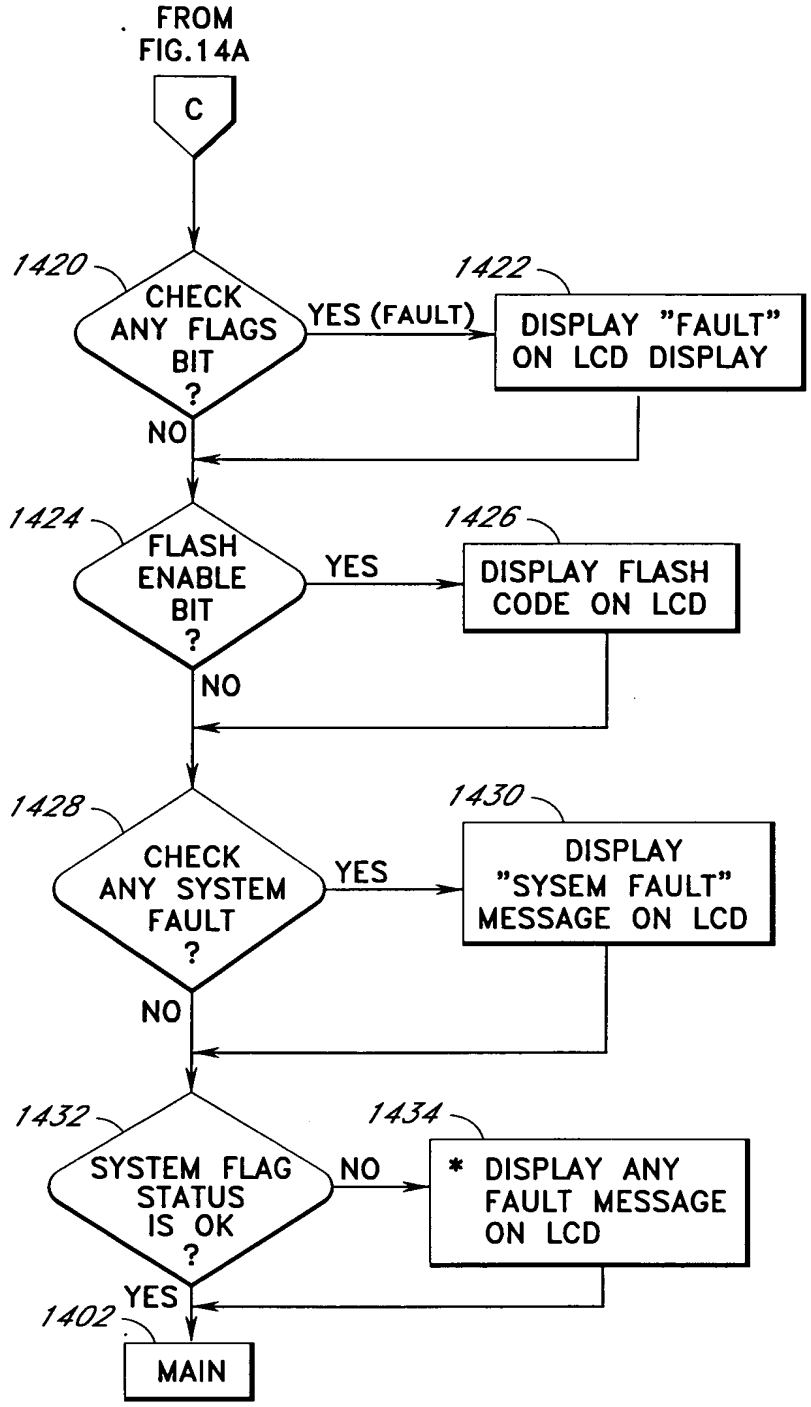

FIG. 14B

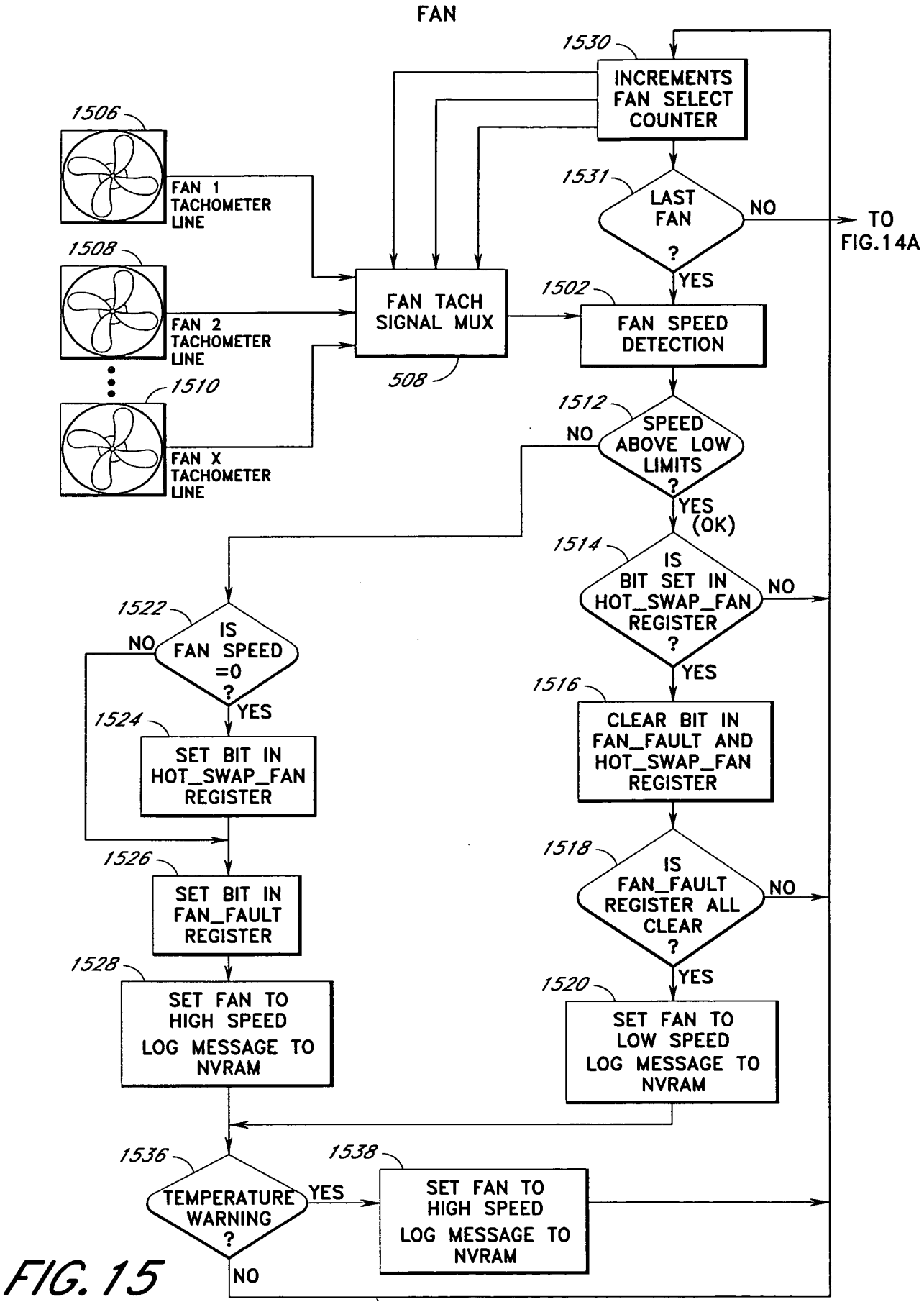
FAN
1530
INCREMENTS FAN SELECT COUNTER
1531
LAST FAN ?
NO
TO FIG.14A
YES
1506
FAN 1 TACHOMETER LINE
1508
FAN 2 TACHOMETER LINE
1510
FAN X TACHOMETER LINE
FAN TACH SIGNAL MUX
508
1502
FAN SPEED DETECTION
1512
SPEED ABOVE LOW LIMITS ?
NO
YES (OK)
1514
IS BIT SET IN HOT_SWAP_FAN REGISTER ?
NO
YES
1516
CLEAR BIT IN FAN_FAULT AND HOT_SWAP_FAN REGISTER
1518
IS FAN_FAULT REGISTER ALL CLEAR ?
NO
YES
1520
SET FAN TO LOW SPEED
LOG MESSAGE TO NVRAM
1522
IS FAN SPEED =0 ?
NO
YES
1524
SET BIT IN HOT_SWAP_FAN REGISTER
1526
SET BIT IN FAN_FAULT REGISTER
1528
SET FAN TO HIGH SPEED
LOG MESSAGE TO NVRAM
1536
TEMPERATURE WARNING ?
YES
NO
1538
SET FAN TO HIGH SPEED
LOG MESSAGE TO NVRAM

FIG. 15

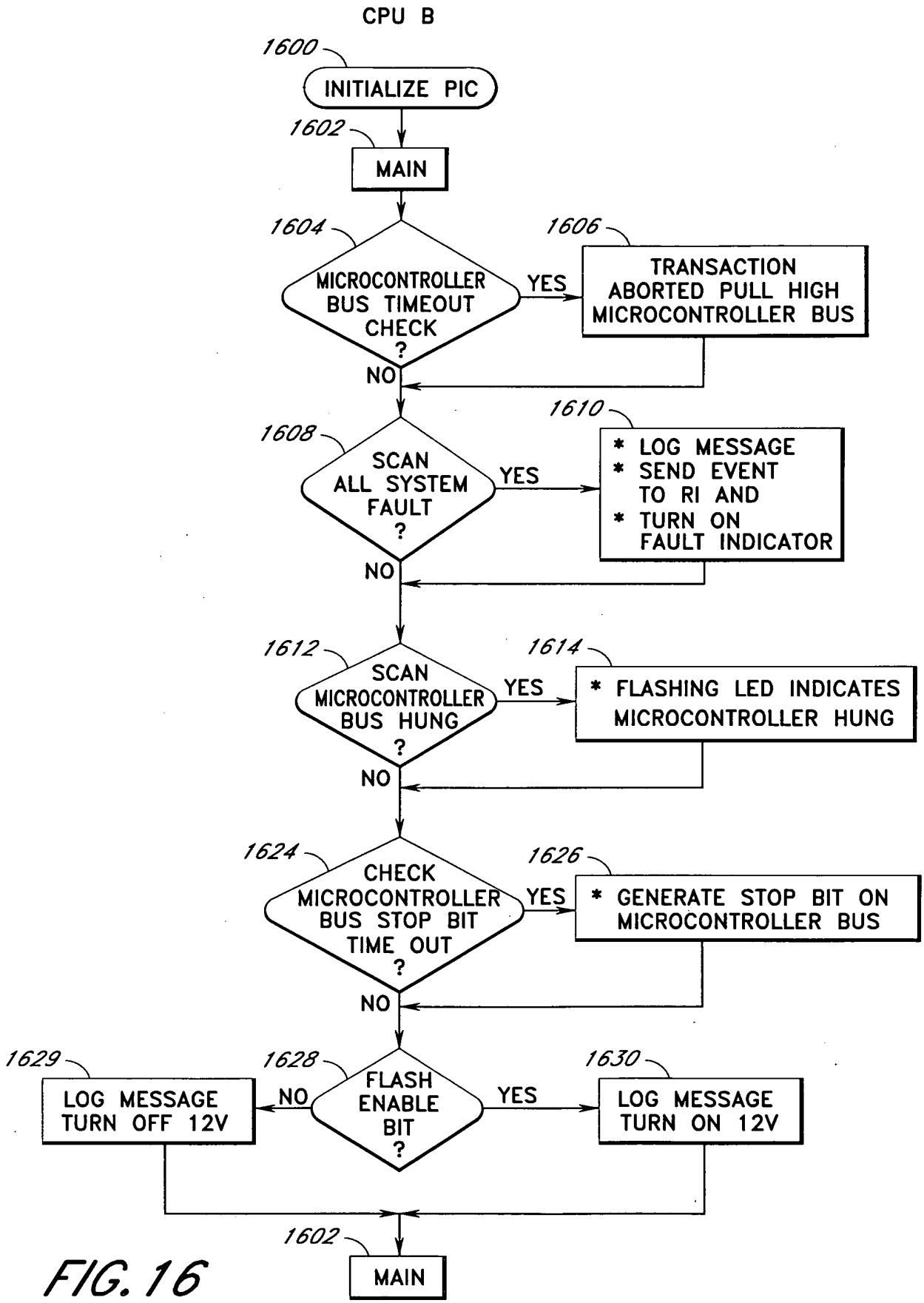
CPU B
1600
INITIALIZE PIC
1602
MAIN
1604
MICROCONTROLLER BUS TIMEOUT CHECK ?
YES
1606
TRANSACTION ABORTED PULL HIGH MICROCONTROLLER BUS
NO
1608
SCAN ALL SYSTEM FAULT ?
YES
1610
* LOG MESSAGE
* SEND EVENT TO RI AND
* TURN ON FAULT INDICATOR
NO
1612
SCAN MICROCONTROLLER BUS HUNG ?
YES
1614
* FLASHING LED INDICATES MICROCONTROLLER HUNG
NO
1624
CHECK MICROCONTROLLER BUS STOP BIT TIME OUT ?
YES
1626
* GENERATE STOP BIT ON MICROCONTROLLER BUS
NO
1629
LOG MESSAGE TURN OFF 12V
1628
NO
FLASH ENABLE BIT ?
YES
1630
LOG MESSAGE TURN ON 12V
1602
MAIN

FIG. 16

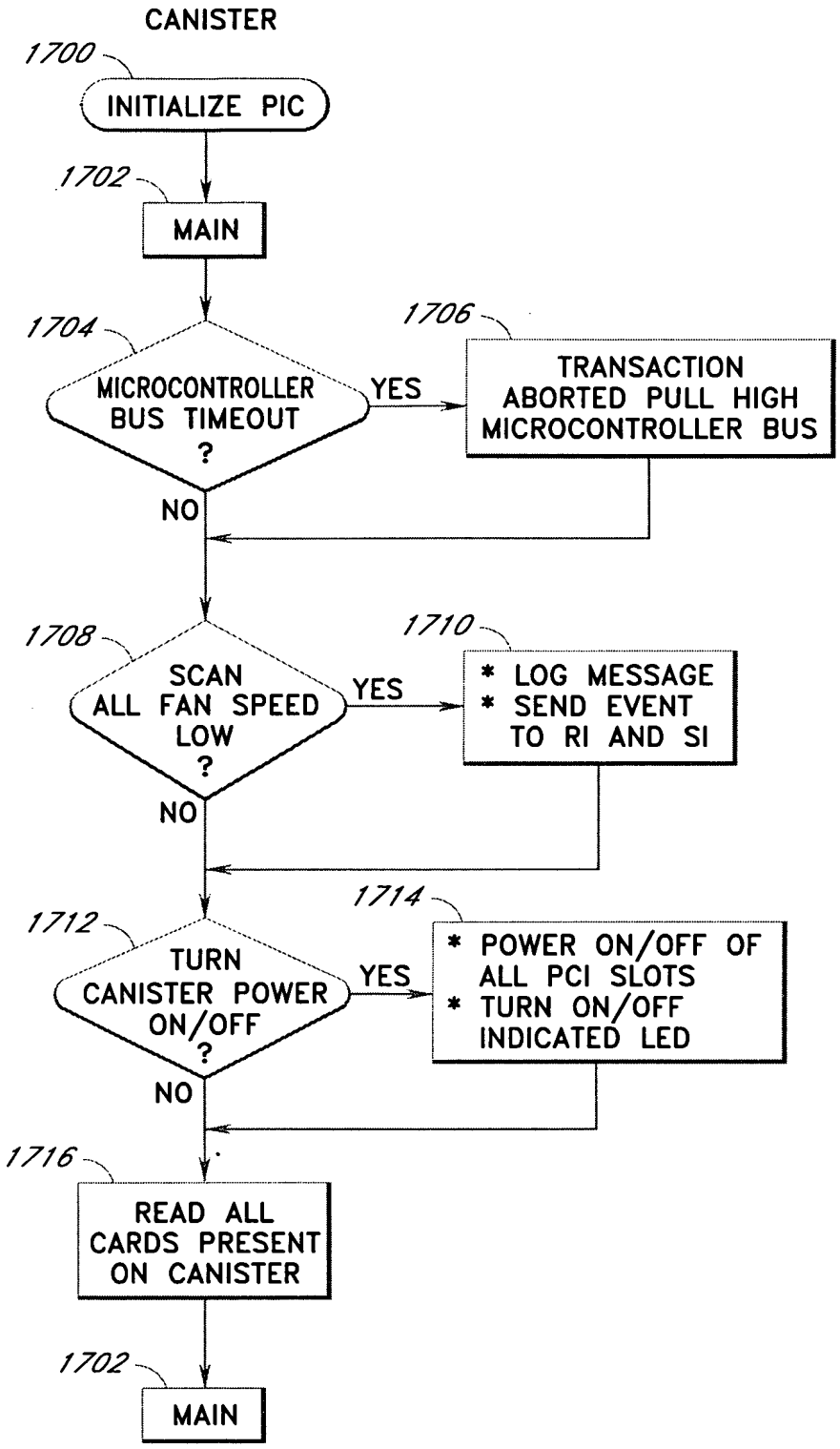
CANISTER
1700
INITIALIZE PIC
1702
MAIN
1704
MICROCONTROLLER BUS TIMEOUT ?
YES
1706
TRANSACTION ABORTED PULL HIGH MICROCONTROLLER BUS
NO
1708
SCAN ALL FAN SPEED LOW ?
YES
1710
* LOG MESSAGE
* SEND EVENT TO RI AND SI
NO
1712
TURN CANISTER POWER ON/OFF ?
YES
1714
* POWER ON/OFF OF ALL PCI SLOTS
* TURN ON/OFF INDICATED LED
NO
1716
READ ALL CARDS PRESENT ON CANISTER
1702
MAIN

FIG. 17

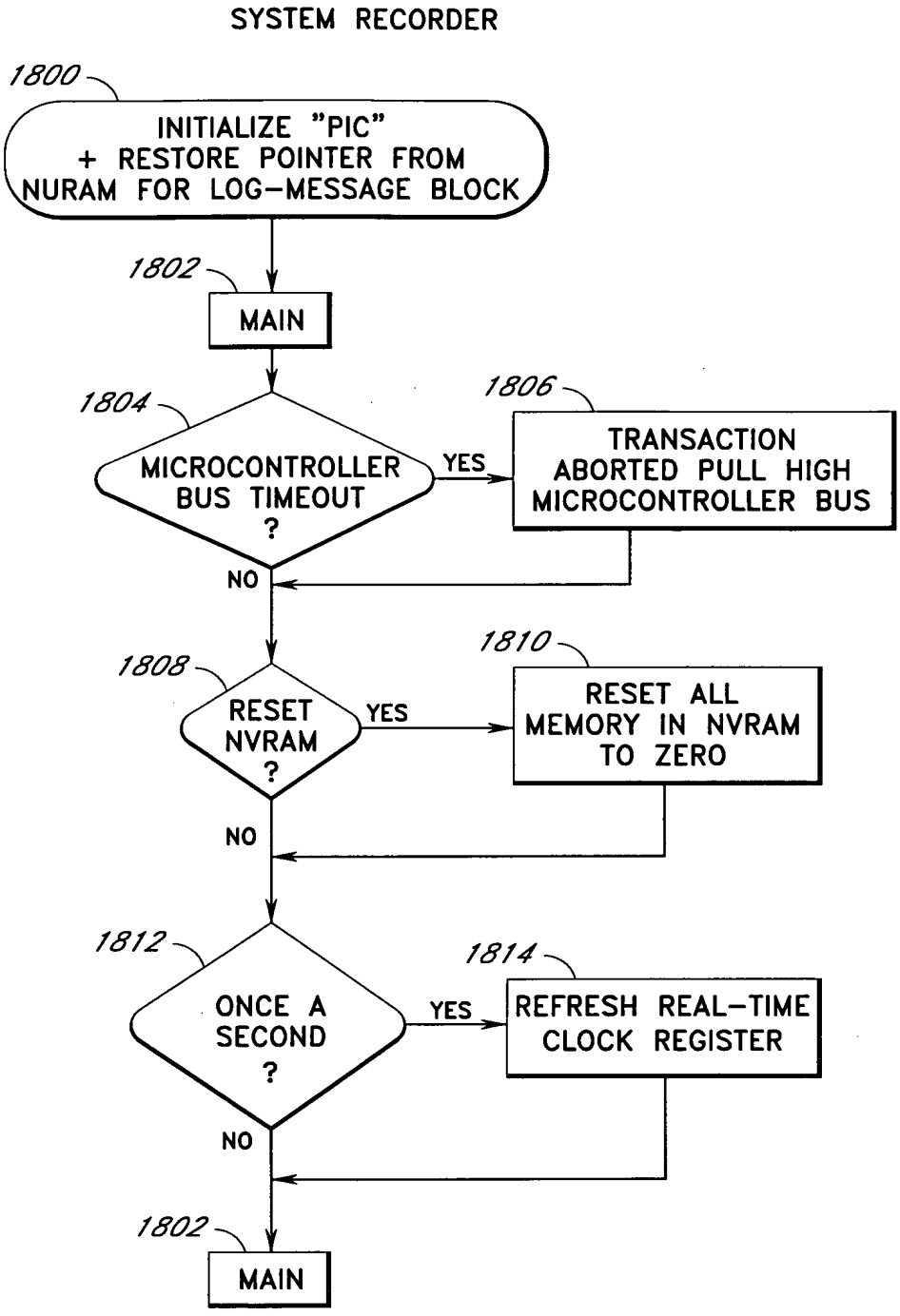
SYSTEM RECORDER
1800
INITIALIZE "PIC" + RESTORE POINTER FROM NURAM FOR LOG-MESSAGE BLOCK
1802
MAIN
1804
MICROCONTROLLER BUS TIMEOUT ?
YES
1806
TRANSACTION ABORTED PULL HIGH MICROCONTROLLER BUS
NO
1808
RESET NVRAM ?
YES
1810
RESET ALL MEMORY IN NVRAM TO ZERO
NO
1812
ONCE A SECOND ?
YES
1814
REFRESH REAL-TIME CLOCK REGISTER
NO
1802
MAIN

FIG. 18